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Characteristics and Mechanisms of Typhoon-Induced Decomposition of Organic Matter and Its Implication for Climate Change

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Typhoons are extreme whether events that can not only affect marine dynamics, but also change marine biogeochemistry, which greatly impact on the marine eco-environment and climate. Recently, we reported that decomposition (as a carbon source) of organic matter (OM) is the dominant process in coastal waters after typhoons, which is contrary to phytoplankton blooms (as a carbon sink) in previous studies. The decomposition directly affects the global carbon and nitrogen cycles, and the efficiency of the biological pump and global climate change. Yet, the mechanisms of OM decomposition after typhoons and the question of whether the decomposition is mainly of particulate organic matter (POM) or dissolved organic matter are still unclear. To address these issues, more than ten typhoons with different intensity, moving speed, and path of the typhoon were chosen, and physicochemical parameters and multiple isotopes in the coastal waters were measured before and after typhoons. The results showed that not all typhoons can trigger phytoplankton blooms in the oceans, which mainly depends on the supply of nutrients after typhoons. However, a positive apparent oxygen utilization value occurred in the coastal waters, suggesting that decomposition of OM was the dominant biogeochemical process regardless of whether phytoplankton blooms occurred after the typhoon. Despite the overall larger DOM in the water column, the amount of POM removed by typhoon-induced decomposition is much greater than that of DOM. Our study suggests that typhoon-induced decomposition might be dominated by POM, which is not conducive to the storage of OM in sediments. It means that the capacity of sediments as a carbon sink will be weakened under global warming (increasing typhoon events).